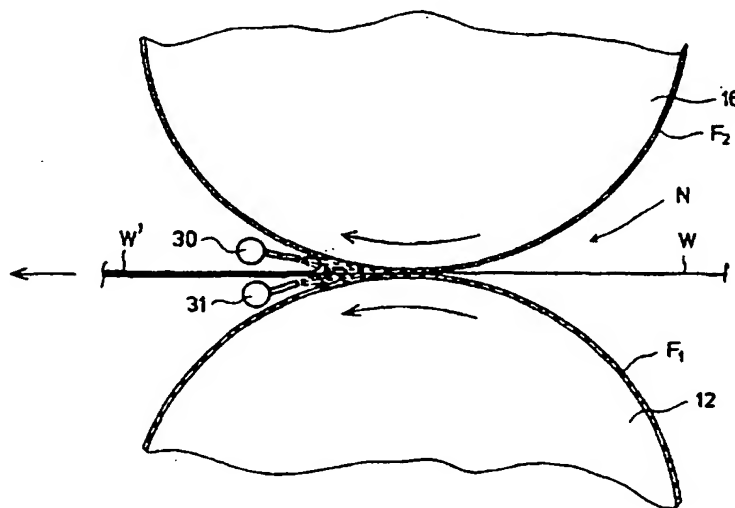




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(21) International Application Number: PCT/FI97/00071 (22) International Filing Date: 6 February 1997 (06.02.97) (30) Priority Data: 960560 7 February 1996 (07.02.96) FI (71) Applicant (for all designated States except US): VALMET CORPORATION [FI/FI]; Panuntie 6, FIN-00620 Helsinki (FI). (72) Inventor; and (75) Inventor/Applicant (for US only): RANTANEN, Rauno [FI/FI]; Oksalanmäki, FIN-40950 Muurame (FI). (74) Agent: FORSSÉN & SALOMAA OY; Yrjönkatu 30, FIN-00100 Helsinki (FI).		(81) Designated States: CA, US, European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE). Published <i>With international search report.</i> <i>In English translation (filed in Finnish).</i>

(54) Title: METHOD IN FILM TRANSFER COATING AND EQUIPMENT INTENDED FOR CARRYING OUT THE METHOD

**(57) Abstract**

The invention concerns a method in film transfer coating, in which the coating agent is applied as a film (F_1 , F_2) onto the face of at least one of the rolls (12, 16) that form a film press nip (N), from which roll face the coating agent is transferred in the nip between the rolls (12, 16) onto the paper or board web (W') running through the nip. According to the invention, in the coating process, formation of coating-agent mist is prevented at the outlet side of the film press nip (N) so that steam jets are applied at least to the side of the web (W) that is being coated. The steam jets are passed favourably to the outlet side of the nip (N), and the steam jets are preferably passed substantially to the point of separation of the web (W') from the film press roll (12, 16). The invention also concerns an equipment intended for carrying out the method.

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Method in film transfer coating and equipment
intended for carrying out the method

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The invention concerns a method in film transfer coating, in which the coating agent is applied as a film onto the face of at least one of the rolls that form a film press nip, from which roll face the coating agent is transferred in the nip between the rolls
10 onto the paper or board web running through the nip.

Further, the invention concerns an equipment intended for carrying out the method in film transfer coating in connection with a film transfer press, which film transfer press comprises a film press nip formed by a pair of rolls, through which nip the
15 paper or board web is passed, and which film transfer press is provided with coating devices for spreading a coating agent as a film onto the face of at least one of the rolls that form the film press nip, from which roll face the coating agent is arranged to be transferred in the nip between the rolls onto the paper or board web.

20 By means of the film transfer technique, in film size presses the application of a size or paste onto the paper is carried out so that, depending on whether one side or both sides of the paper are supposed to be coated, coating agent films of the desired thickness are spread onto the face or faces of one or both of the rolls in the film size press by means of applicator devices, in which connection these coating agent films
25 are transferred onto the paper web in the nip formed by the size press rolls as the paper web runs through said nip. As a rule, the film rolls in the film size presses are provided with resilient coatings, and the application onto the roll face can be carried out by using some prior-art blade coater, a bar coater provided with a smooth or grooved coating bar, or an equivalent nozzle equipment. At present, in paper
30 machines and, thus, also in the related film size presses, ever higher speeds are aimed at, in which connection in particular this increased speed in size film presses has provided a new problem, i.e., in particular when running takes place with large

coating quantities, formation of mist of the coating agent occurs at the outlet side of the press nip. The formation of mist in itself would not be a major problem, but a problem arises when this mist gathers on the constructions of the machine and drips from there onto the paper web and spoils the paper quality, or when the mist spreads
5 into the air in the room. Since the problem has been encountered with higher significance only with increased web speeds, in the prior art at least substantially significant solutions have not been suggested for elimination of this problem.

Indeed, there are some prior-art solutions, and of them can be mentioned, for
10 example, the FI Patent No. 90,266, in whose solution attempts have been made to prevent formation of mist by using a particular hood construction. Similarly, in the FI Patent No. 93,243 a solution is suggested in which the formation of mist in itself is not prevented, but this mist is recovered, or at least attempts are made to recover the mist, by means of mechanical devices fitted at the outlet side of the nip, so that
15 the mist should not have access to other constructions. Thus, this earlier publication does not provide a solution for the formation of mist itself either.

The object of the present invention is to provide a method by whose means, in the film size press, formation of mist of coating agent and problems arising from same
20 are avoided. In view of achieving this object, the method in accordance with the invention is mainly characterized in that, in the coating process, formation of coating-agent mist is prevented at the outlet side of the film press nip so that steam jets are applied at least to the side of the web that is being coated.

25 The equipment in accordance with the invention is mainly characterized in that, in connection with the film transfer press, steam supply devices are provided so as to apply steam jets at least to the side of the web that is being coated in order to prevent formation of coating-agent mist at the outlet side of the film press nip in connection with the coating process.

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It is the most important advantage of the present invention over the prior-art solutions that, in the invention, in itself, attempts are not made just to prevent

spreading of mist, but in stead, attempts are made to prevent formation of mist completely. When no mist is formed at all, it does, consequently, not constitute problems either. The formation of mist is prevented in the present invention by means of spraying of steam, which provides the additional advantage that, by means of said steam jets, the web is supported and, thus, fluttering of the web is prevented, and it has been noticed that said fluttering in itself causes formation of mist. Further advantages and characteristic features of the invention will come out from the following detailed description of the invention.

10 In the following, the invention will be described by way of example with reference to the figures in the accompanying drawing.

Figure 1 is a fully schematic side view of a film press in which the method in accordance with the present invention is utilized.

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Figure 2 is a schematic illustration of an enlarged detail from the area A in Fig. 1.

Figures 3A and 3B are schematic illustrations of further embodiments of the invention, applied to single-sided coating of the web.

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In Fig. 1, the film press is denoted generally with the reference numeral 10. The film press 10 comprises a film press frame 11 mounted on a foundation C, on which frame 11 the film press rolls 12,16 are mounted in a conventional way. The bearing housing 13 of the first film press roll, i.e. the lower roll, is mounted directly on the frame 11 of the film press and attached to the frame rigidly. On the other hand, the bearing housing 17 of the second film press roll, i.e. the upper roll, is mounted on a loading arm 19, which is linked pivotally on the film press frame 11 by means of a pivot shaft placed in the cross direction of the machine. Between the loading arm 19 and the film press frame 11, loading cylinders 22 are fitted, by whose means the loading arm 19 is loaded in order to produce a nip pressure of the desired extent in the nip N formed by the lower roll 12 and the upper roll 16. Either one of the film press rolls 12,16, preferably the upper roll 16, or, alternatively, both of the film

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press rolls 12,16 can be variable-crown rolls in order that the nip N pressure could be brought to the desired level in the cross direction of the machine. In the solution shown in Fig. 1, each film press rolls 12,16 is provided with coating means 15,21, by whose means the size films or equivalent coating agent films are spread and smoothed onto the faces 14,18 of said rolls. Of course, it is fully obvious that, if the web W supposed to be coated from one side only, the film press roll placed at the corresponding side of the web W is provided with a coating device, in which case the film press roll at the opposite side is not coated.

10 In the solution shown in Fig. 1, when the web W runs through the nip N, the coating agent films are transferred from the roll 12,16 faces 14,18 onto the web W'. The web W is passed into the film press nip N over a guide roll 23, which is mounted on a stationary frame 24 mounted on the foundation C. After the film press nip N, the web W' is passed over a spreader roll 25 to further processing. The construction and the operation of the coating devices 15,21 are not described in detail in this connection, because they can be conventional, known from the prior art, and, thus, they do not constitute a part of the present invention. Nor will the means of support of the spreader roll 25 be described in more detail in this connection. In particular in pigment coating, after the film size press, as a rule, airborne web dryers are employed before a drying cylinder.

The method in accordance with the present invention is based on supply of steam onto the web W, and most advantageously the steam is supplied as steam jets to the outlet side of the nip N. This is seen in Fig. 1 in the area A and in more detail in Fig. 2. Steam can also be supplied onto the web W before the nip N, as is shown in the area B in Fig. 1. This will be reverted to briefly later.

As was already described above in relation to Fig. 1, in film press coating, the coating agent is applied as films F_1, F_2 onto the faces of the film press rolls 12,16 that form the nip N, and the web W is passed through said film press nip N, in which connection, in the nip, the coating agent films F_1, F_2 are substantially transferred onto the web W', as is illustrated in Fig. 2. Further, as was described above,

in particular new and high-speed machines involve the problem that, in particular when running takes place at high speeds and with large coating quantities, at the outlet side of the film press nip N formation of coating-agent mist occurs. Thus, in the present invention, this problem has been solved so that, at least at the outlet side of the nip N, at least on the side of the web W' that is supposed to be coated, steam supply means 30,31 are provided, from which steam jets are passed after the nip N to the point of separation between the web W' and the roll 12,16. With this procedure, it has been possible to exclude formation of mist completely, even though it is not known exactly what this elimination of mist is based on.

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Concerning this, a number of different alternative theories can be presented, whose correctness has not been proved with certainty. According to one theory, the steam "condenses" the mist onto the web W'. A theory has also been presented according to which, in the steam phase, the film splitting filaments are shorter because of the difference in surface energy between air and steam. Further, it has been suggested that the steam jet stabilizes the web separation line. Further, it has been suggested that the steam raises the temperature of the roll face or forms an aqueous film on the roll face, in which connection the splitting of the film is facilitated.

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As was stated above, it has not been possible to present a fully reliable theory concerning the prevention of mist formation, but, in any case, it has been established with certainty, with a great surprise, that passing of steam jets to the outlet side of the nip N to the point of separation between the web W' and the roll 12,16 makes the mist disappear.

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With reference to Fig. 1 above, the further possibility is provided that the web W can already be steam-treated before the nip N. In this way the temperatures of the films F_1, F_2 could be made higher, which in itself would reduce the mist formation. In Fig. 1 it is illustrated schematically that the steam supply means 32,33 placed before the nip N are placed quite far before the nip N. It might, however, be preferable that said devices are placed in direct vicinity of the nip N, in which case the steam jets could be directed either at the web W, at the coating agent films

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present on the faces 14,18 of the film press rolls, or directly into the nip N, i.e. into the gap between the roll face 18/14 and the web W. The primary solution is, however, that shown in more detail in Fig. 2, i.e. spraying of steam to the outlet side of the nip.

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Figs. 3A and 3B show further embodiments of the invention, which embodiments are, in the illustrations in the figures, applied to single-sided coating of the web. In the solutions as shown in these figures, a coating device 15 has been fitted in connection with one roll 12 only, of the rolls that form the film press nip N, which
10 coating device applies a film of coating agent onto the face of said roll 12. In said exemplifying embodiments, at the outlet side of the nip N, a collecting equipment 40a,40b is fitted, which is supposed to prevent spreading of steam or coating-agent mist that may possibly have been formed in the coating process into the air in the room. The embodiments shown in Figs. 3A and 3B are highly similar to one
15 another, so that, in the following, they will be examined together. The collecting equipment 40a,40b comprises a basin or trough provided with walls 41a,41b, which basin or trough is, as is shown in the figures, preferably fitted in the gap between the web W and the roll 12 provided with a coating device 15, at the outlet side of the nip N. The collecting equipment 40a,40b is fitted at a very short distance from
20 said roll 12, preferably so that the wall of the collecting equipment 40a,40b placed towards the roll 12 passes along the roll 12 face. The collecting equipment 40a,40b is connected with a suction duct 44a,44b, through which a suction and at least a partial vacuum are applied to the collecting equipment 40a,40b, so that, by the effect of said vacuum, the steam and the coating-agent mist are gathered in the collecting
25 trough. Further, the collecting equipment 40a,40b is supposed to take advantage of the condensation effect, and therefore preferably at least one of the walls of the collecting equipment 40a,40b is provided with cooling. Further, the collecting equipment 40a,40b is provided with a top cover 42a,42b, which is fitted in the vicinity of the web W. In the exemplifying embodiment shown in Fig. 3B, the top
30 cover 42b is further provided with sides extending above the edges of the web W. The top cover 42a,42b is arranged to be displaceable and adjustable in the lateral direction in compliance with the web width. Therefore, the collecting equipment

40a,40b is provided with guides 43a,43b, along which the top cover 42a,42b can be displaced.

5 Since, in the coating process, the formation of the coating-agent mist takes place expressly at the outlet side of the nip N, it is fully possible to use a collecting equipment 40a,40b as shown in Figs. 3A and 3B alone to collect and to dispose of the coating-agent mist that has been formed, without the supply of steam onto the web W that was described above. Even by means of the collecting equipment 40a,40b alone, it is possible to reduce the coating-agent mist at least substantially.

10 Of course, it is possible and even advantageous to make use of the collecting equipment as shown in Figs. 3A and 3B in connection with the supply of steam, in which case the formation of coating-agent mist can be excluded most efficiently.

15 Above, the invention has been described by way of example with reference to preferred exemplifying embodiments of the invention illustrated in the figures in the accompanying drawing. The invention is, however, not confined to the exemplifying embodiments shown in the figures alone, but different embodiments of the invention can show variation within the scope of the inventive idea defined in the accompanying patent claims.

Claims

1. A method in film transfer coating, in which the coating agent is applied as a film (F_1, F_2) onto the face of at least one of the rolls (12,16) that form a film press nip (N), from which roll face the coating agent is transferred in the nip between the rolls (12,16) onto the paper or board web (W') running through the nip, characterized in that, in the coating process, formation of coating-agent mist is prevented at the outlet side of the film press nip (N) so that steam jets are applied at least to the side of the web (W) that is being coated.
2. A method as claimed in claim 1, characterized in that the steam jets are passed to the outlet side of the nip (N).
3. A method as claimed in claim 1 or 2, characterized in that the steam jets are passed substantially to the point of separation of the web (W') and the film press roll (12,16).
4. A method as claimed in any of the preceding claims, characterized in that the web (W) is steam-treated before the nip (N) in order to raise the temperature of the coating agent films.
5. A method as claimed in claim 4, characterized in that in the steam treatment taking place before the nip (N) the steam jets are directed either at the face/faces of the film press roll/rolls or directly at the web (W).
6. A method as claimed in claim 4, characterized in that in the steam treatment taking place before the nip (N) the steam jets are directed substantially directly into the nip (N) into the gap between the film press roll (12 and/or 16) and the web (W).
7. A method as claimed in any of the preceding claims, characterized in that spreading of steam and of coating-agent mist that may have been formed into the air

in the room is prevented by means of a collecting equipment (40a;40b) fitted after the nip (N) and based on suction and on the effect of condensation.

8. A method as claimed in claim 7, **characterized** in that one or several walls (41a;41b) of the collecting equipment (40a;40b) is/are cooled in order to produce and/or to enhance the condensation effect.

9. A method as claimed in claim 7 or 8, **characterized** in that a vacuum is produced in the collecting equipment (40a;40b), by means of which vacuum steam and/or coating-agent mist is sucked into the collecting equipment (40a;40b) and by whose means the steam, the coating-agent mist and the condensate water are sucked away from the collecting equipment (40a;40b).

10. An equipment intended for carrying out the method as claimed in any of the preceding claims in film transfer coating in connection with a film transfer press (10), which film transfer press (10) comprises a film press nip (N) formed by a pair of rolls (12,16), through which nip the paper or board web (W) is passed, and which film transfer press (10) is provided with coating devices (15,21) for spreading a coating agent as a film (F_1, F_2) onto the face (14,18) of at least one of the rolls that form the film press nip (N), from which roll face the coating agent is arranged to be transferred in the nip (N) between the rolls onto the paper or board web (W), **characterized** in that, in connection with the film transfer press (10), steam supply devices (30,31;32,33) are provided so as to apply steam jets at least to the side of the web (W) that is being coated in order to prevent formation of coating-agent mist at the outlet side of the film press nip (N) in connection with the coating process.

11. An equipment as claimed in claim 10, **characterized** in that the steam supply devices (30,31) are fitted to pass the steam jets to the outlet side of the nip (N).

12. An equipment as claimed in claim 10 or 11, **characterized** in that the steam supply devices (30,31) are fitted to pass the steam jets substantially to the point of separation of the web (W') and the film press roll (12,16).

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13. An equipment as claimed in any of the claims 10 to 12, **characterized** in that the steam supply devices (32,33) are fitted before the nip (N) in order to steam-treat the web (W) and to raise the temperature of the coating agent films.

5 14. An equipment as claimed in claim 13, **characterized** in that the steam supply devices (32,33) are directed to pass the steam jets either onto the face/faces of the film press roll/rolls (12,16) or directly onto the web (W).

10 15. An equipment as claimed in claim 13, **characterized** in that the steam supply devices (32,33) are directed to pass the steam jets directly into the nip (N), into the gap between the film press roll (12 and/or 16) and the web (W).

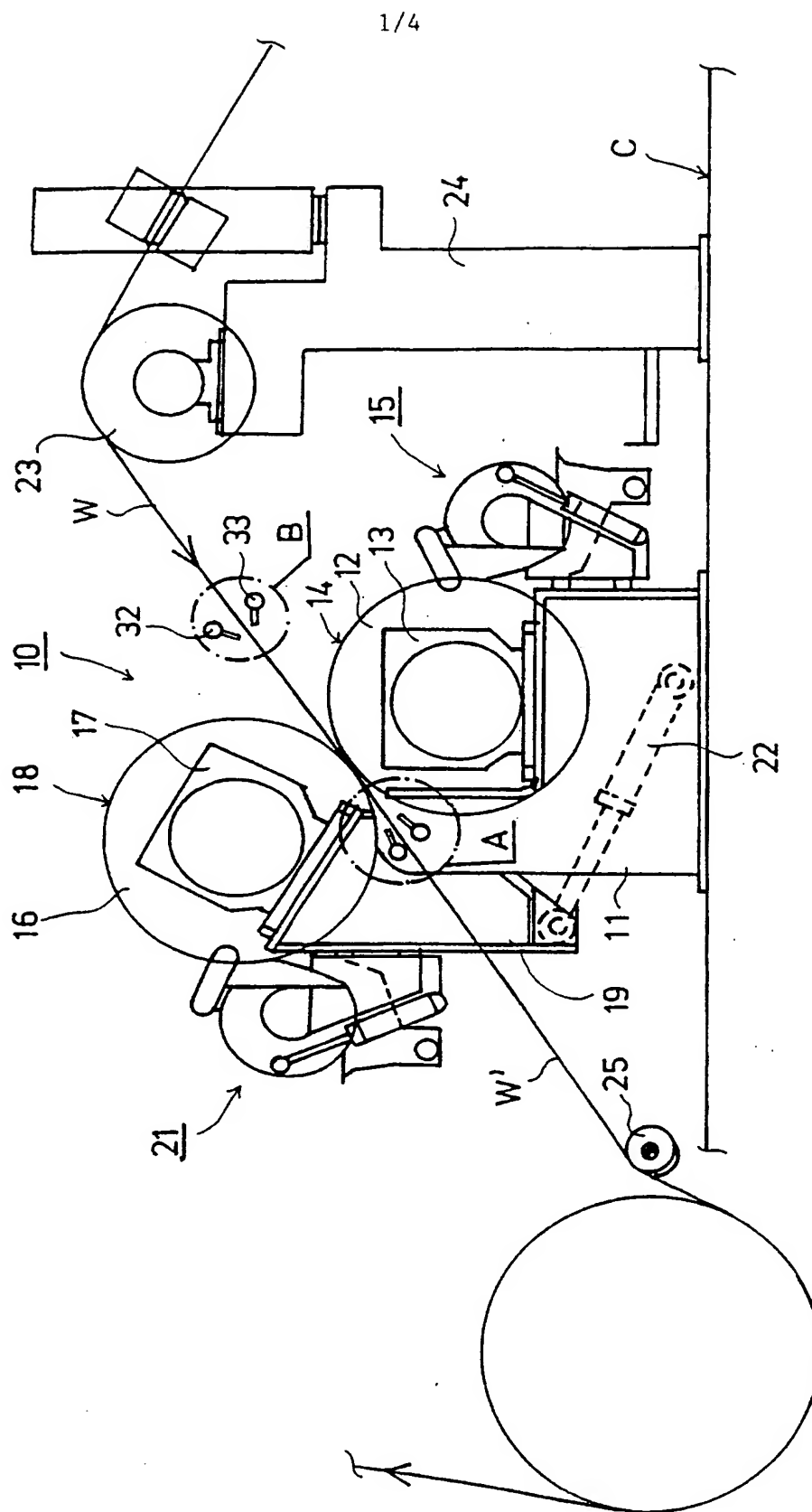
15 16. An equipment as claimed in any of the claims 10 to 15, **characterized** in that after the nip (N) a collecting equipment (40a;40b) subjected to a vacuum and/or based on the condensation effect is provided so as to collect and to dispose of steam and of any coating-agent mist that may have been formed.

20 17. An equipment as claimed in claim 16, **characterized** in that the collecting equipment (40a;40b) is provided with walls (41a;41b), of which walls one is placed along with the face of the film press roll (12) at a short distance from said roll face, and with a top cover (42a;42b) fitted in the vicinity of the web (W).

25 18. An equipment as claimed in claim 16 or 17, **characterized** in that at least one of the walls of the collecting equipment (40a;40b) can be cooled so as to produce and/or to enhance the condensation effect.

19. An equipment as claimed in any of the claims 16 to 18, **characterized** in that the top cover (42a;42b) of the collecting equipment can be displaced and positioned in the cross direction in compliance with the width of the web (W).

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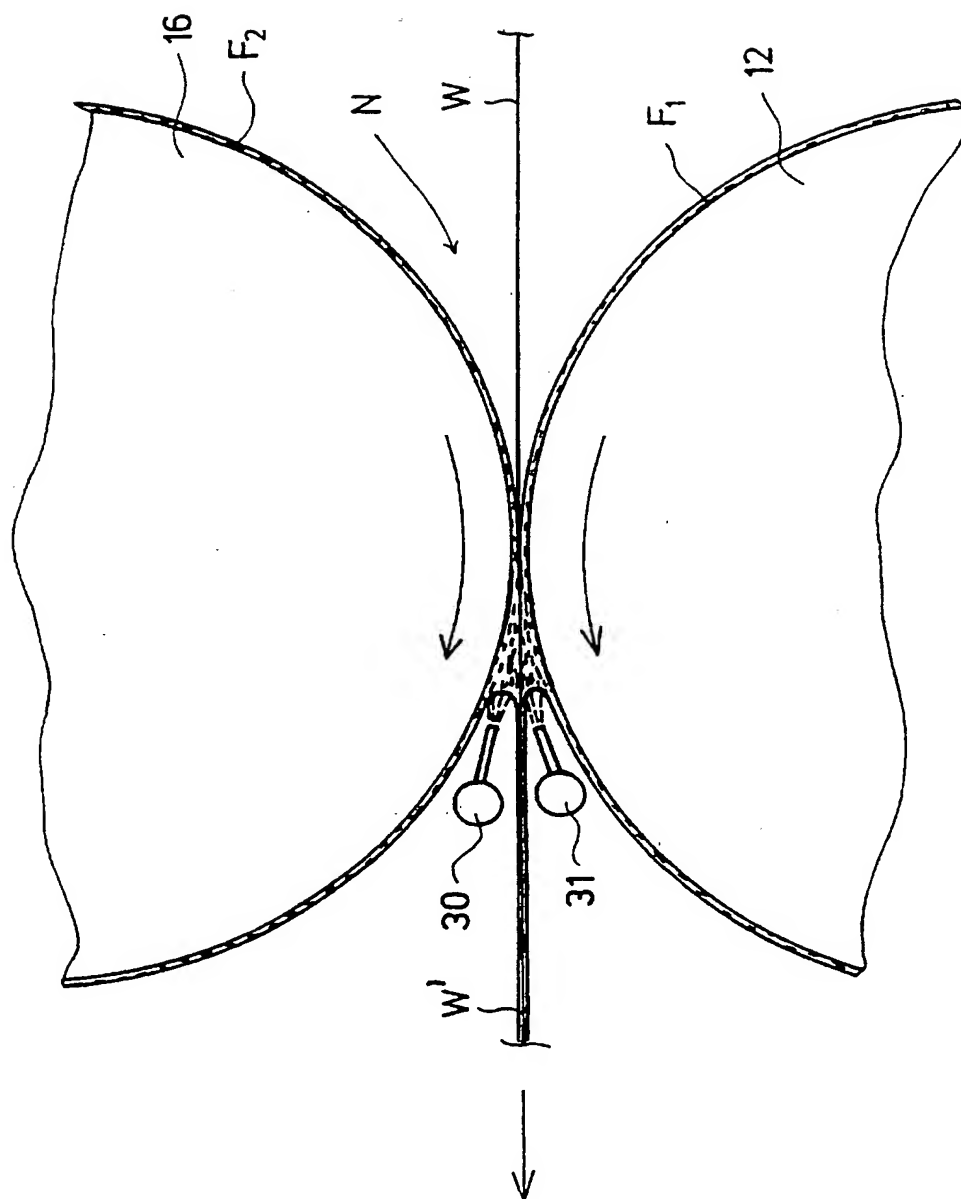
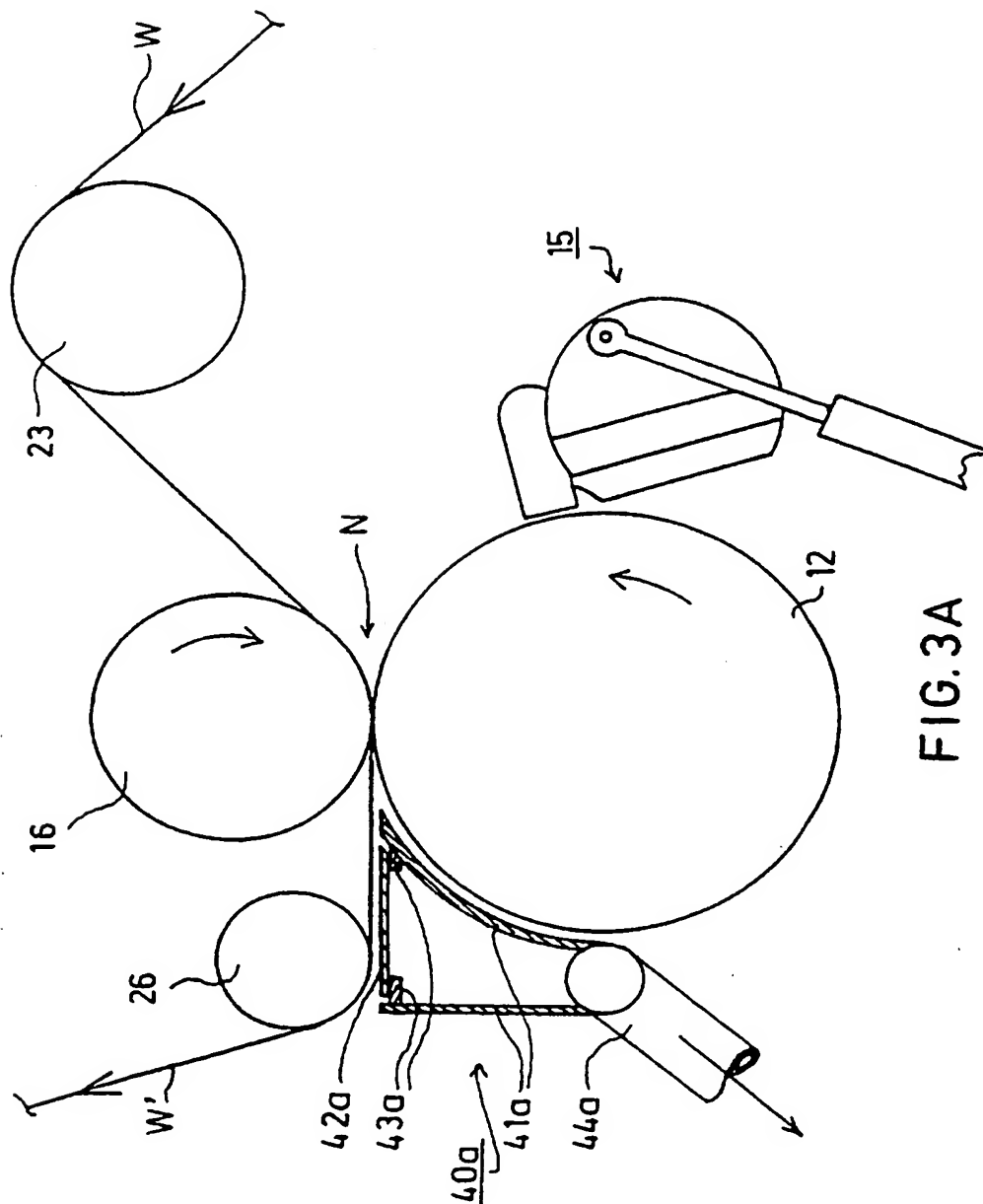


FIG. 2



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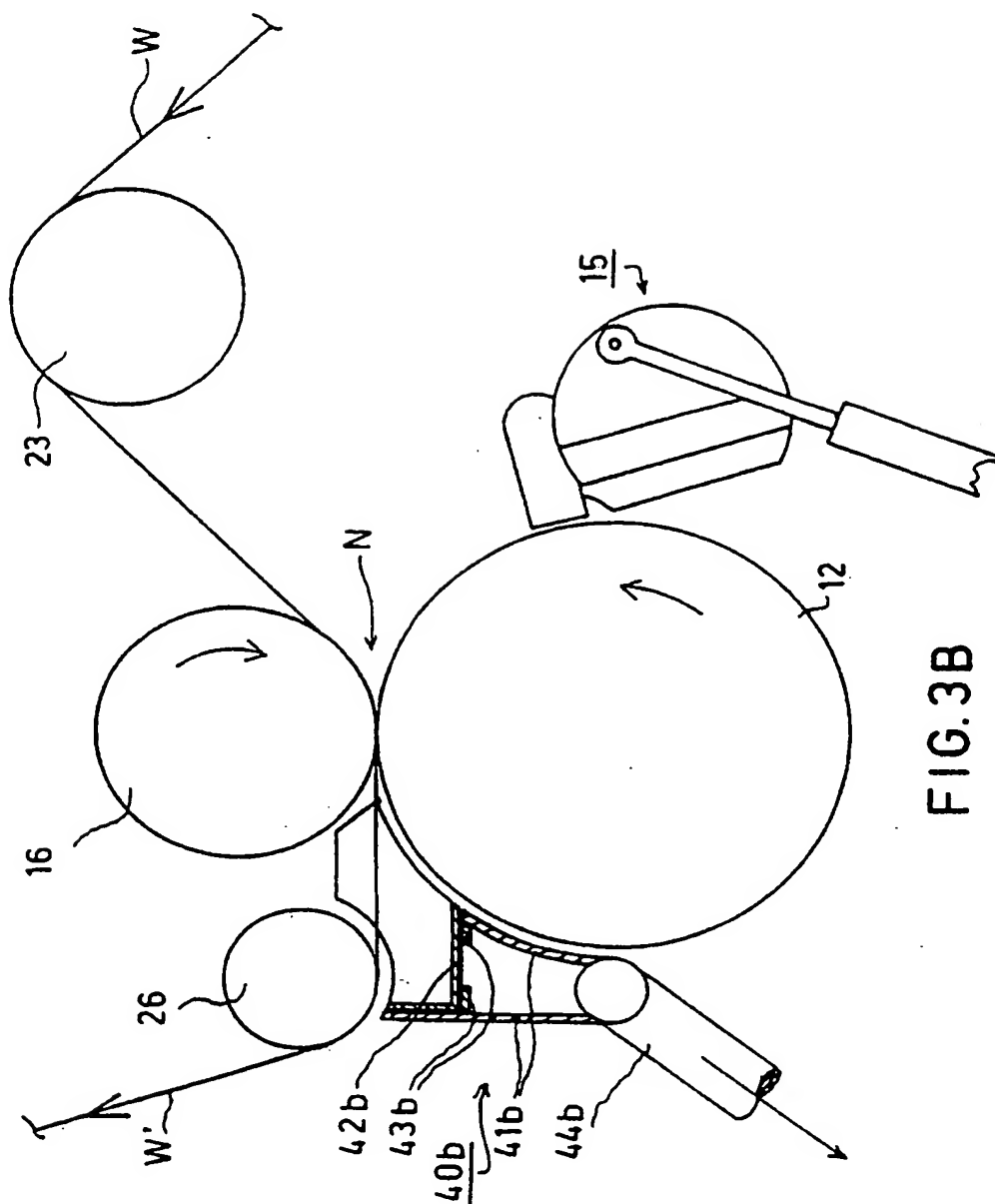


FIG. 3B

INTERNATIONAL SEARCH REPORT

International application No.

PCT/FI 97/00071

A. CLASSIFICATION OF SUBJECT MATTER

IPC6: D21H 23/56, B05C 1/08, B05C 11/06
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC6: D21H, B05C, B05D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

WPI

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	GB 1419442 A (HANS BACHOFEN), 31 December 1975 (31.12.75), claim 1 --	1-19
A	FI 93243 B (VALMET PAPER MACHINERY INC.), 30 November 1994 (30.11.94), abstract --	1-19
A	US 5483873 A (PEKKA KOIVUKUNNAS ET AL), 16 January 1996 (16.01.96), abstract -- -----	1-19

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

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Date of the actual completion of the international search

29 April 1997

Date of mailing of the international search report

10.05.97

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INTERNATIONAL SEARCH REPORT

Information on patent family members

02/04/97

International application No.

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Patent document cited in search report			Publication date	Patent family member(s)		Publication date
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